

I claim:

1. A brushless AC/DC starter generator including:  
a permanent magnet generator, having a rotor including first magnetic field and a stator having a first armature;  
an exciter generator, having a second armature on said rotor, and a second magnetic field on said stator;  
a main generator, having a third magnetic field on said rotor, and third and fourth armature, on said stator;  
a generator control unit electrically connected to said first armature to sense the speed of rotation of said rotor, and electrically connected to said fourth armature to sense the load on said armature, and electrically connected to said second magnetic field, to vary said second magnetic field.
2. The brushless AC/DC starter generator of claim 1, where the first magnetic field is created by at least one permanent magnet, the second magnetic field is generated by an electromagnet and the third magnetic field is generated by an electromagnet.
3. The brushless AC/DC starter generator of claim 1, further including:  
a rectifier electrically connected to said second armature and said third magnetic field, said rectifier converting AC current from the second armature into DC current to the third magnetic field.
4. The brushless AC/DC starter generator of claim 1, further including a rectifier electronically connected to said fourth armature, said rectifier providing at least one output of DC current.
5. The brushless AC/DC starter generator of claim 1, the rotor further including a damper winding.
6. The brushless AC/DC starter generator of claim 5, including a start inverter electrically connected to the third armature, and electrically connected to a power source, said start inverter selectively energizing said fourth armature to create at least one magnetic field, said damper winding positioned to react to said at least one magnetic field.

7. The brushless AC/DC starter generator of claim 6, including contactor to selectively interrupt the electrical connection between said start inverter and said third armature.

8. The brushless AC/DC starter generator of claim 3, where the electrical connection between said second armature and said third magnetic field includes a switch.

9. The brushless AC/DC starter generator of claim 8, where the electrical connection between said second armature and said third magnetic field includes a resistor in parallel with the device creating the third magnetic field.

10. A method of starting an aircraft engine including the steps of:  
providing a brushless AC/DC starter generator including:  
a permanent magnet generator, having a rotor including first magnetic field and a stator having a first armature;  
an exciter generator, having a second armature on said rotor, and a second magnetic field on said stator;  
a main generator, having a third magnetic field on said rotor, and second and third armature, on said stator;  
a generator control unit electrically connected to said first armature to sense the speed of rotation of said rotor, and electrically connected to said third armature to sense the load on said armature, and electrically connected to said second magnetic field, to vary said second magnetic field;  
rectifier electrically connected to said second armature and said third magnetic field, said rectifier converting AC current from the second armature into DC current to the third magnetic field, the rotor including a damper winding; and  
providing electrical power to said third armature to create a magnetic field, said magnetic field created in said third armature interacting with said damper winding.

11. The method of claim 10, including;  
sensing the rotational speed of the rotor, and removing the electrical power to the third armature once a desired speed is maintained and the aircraft engine is providing motive force to the rotor.

12. The method of claim 10, the generator control unit is electrically connected to the first armature to sense the speed of rotation of the rotor.

13. The method of claim 11, further including the steps of providing an electrical connection between said first armature and said generator control unit, so as to provide AC power from the permanent magnet; and converting the AC power received from the permanent magnet generator to DC, and supplying the DC power to the second magnetic field, said DC power in the second magnetic field interacting with the second armature to generate AC power.

14. The method claim 13, further including:  
providing a first contactor electrically connected to said third armature and a second contactor on said fourth armature, said contactors selectively connecting said second and third armatures with electrical loads.

15. The method of claim 14 further including:  
third disconnecting the third and fourth armature from electrical loads prior to providing electrical power to said third armature, and connecting the second and third armatures to electrical loads after a predetermined voltage is available at the third armature.

16. A brushless AC/DC starter generator including a permanent magnet generator, having a permanent magnet on a rotor, and a starter having an armature, said magnet and armature positioned to produce AC current at an output;

an exciter generator, having an armature on the rotor, and an electromagnet on the stator, said electromagnet and armature positioned to produce AC power at an output;

a main generator having an electromagnet on the rotor, a first armature on the stator, and a second armature on the stator, said electromagnet interacting with the first and second armatures to create AC power at a first output electrically connected to said first armature, and at a second output electrically connected to said second armature, and

a generator control unit electrically connected to a sensor to sense the speed of rotation of the rotor, and electrically connected to at least one of the main generator outputs to sense the voltage of the output, and electrically connected to the electromagnet of the exciter generator.

17. The apparatus of claim 16, further including:

a rectifier electrically connected to one of the outputs of the main generator, the rectifier having an output for DC current.

18. The apparatus of claim 16, further including a rectifier electrically connected to the output of the exciter generator, said rectifier having a DC output, said DC output electrically connected to said main generator electromagnet.

19. The apparatus of claim 18, further including a damper winding on the rotor, said damper winding being positioned to react to a magnetic field generated in the second armature of the main generator; and a power source electrically connected to the second armature of the main generator to create the magnetic field.

20. The apparatus of claim 19, further including a switch to electrically connect the power source to the second armature of the main generator.

21. The apparatus of claim 20, further including a switch between the main generator electromagnet, and the output of the second armature, said switch creating a shorted path, for current produced by the main generator electromagnet.